

### CERTIFICATE OF ANALYSIS

Bechtel Hanford, Inc.  
3350 George Washington Way  
Richland, WA 99352

May 21, 1999

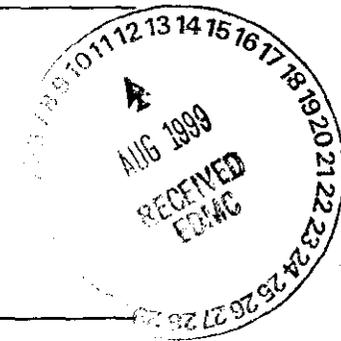
Attention: Joan Kessner



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SAF Number : B99-041  
Date First Sample Received : May 5, 1999  
Number of Samples : Eight  
Sample Type : Soil  
SDG Number : W02765  
Data Deliverable : 21-Day Priority/45 Day Summary

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#### I. Introduction

Between May 5, and May 6, 1999, eight water samples were received by the Quanterra Environmental Services Richland Laboratory (QESRL) for chemical analysis. Upon receipt, the samples were assigned the following laboratory ID number to correspond with the Bechtel Hanford, Inc. (BHI) specific ID:

<u>QESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
9CVFC810	BOV8N1	Soil	5/5/99
9CVFCA10	BOV8N2	Soil	5/5/99
9CVFCC10	BOV8N3	Soil	5/5/99
9CVFCE10	BOT8N4	Soil	5/5/99
9CVGK510	BOV8N5	Soil	5/6/99
9CVGK610	BOV8N6	Soil	5/6/99
9CVGK710	BOV8N7	Soil	5/6/99
9CVGK810	BOV8N8	Soil	5/6/99

#### II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information; analytical results and the appropriate associated statistical errors.

Bechtel Hanford, Inc.  
May 21, 1999  
Page 2

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The requested analysis was:           **Hexavalent Chromium**  
  Hexavalent Chromium by EPA7196

III.    Quality Control

The analytical results for the analysis performed under SDG W02765 include a minimum of one Laboratory Control Sample (LCS), one matrix spike (MS), one matrix spike duplicate (MSD), and one method (reagent) blank. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results.

IV.    Comments

**Hexavalent Chromium**  
Hexavalent Chromium by EPA7196

The LCS, MS, LCSD, batch blank, and sample results are within the requirements of the contract.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:



Doug Swenson  
Project Manager

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVFC810 MATRIX: SOIL  
CLIENT ID: B0V8N1 DATE RECEIVED: 5/5/99 1:23:00 PM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.00E-02	U	N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVFCA10 MATRIX: SOIL  
CLIENT ID: B0V8N2 DATE RECEIVED: 5/5/99 1:23:00 PM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.00E-02	U	N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVFCC10 MATRIX: SOIL  
CLIENT ID: B0V8N3 DATE RECEIVED: 5/5/99 1:23:00 PM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.00E-02	U	N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland      SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVFCE10      MATRIX: SOIL  
CLIENT ID: B0V8N4      DATE RECEIVED: 5/5/99 1:23:00 PM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.99E-01		N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland      SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVGK510      MATRIX: SOIL  
CLIENT ID: B0V8N5      DATE RECEIVED: 5/6/99 11:30:00 AM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.00E-02	U	N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVGK610 MATRIX: SOIL  
CLIENT ID: B0V8N6 DATE RECEIVED: 5/6/99 11:30:00 AM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.00E-02	U	N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVGK710 MATRIX: SOIL  
CLIENT ID: B0V8N7 DATE RECEIVED: 5/6/99 11:30:00 AM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.00E-02	U	N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: 9CVGK810 MATRIX: SOIL  
CLIENT ID: B0V8N8 DATE RECEIVED: 5/6/99 11:30:00 AM

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	4.00E-02	U	N/A	N/A	4.00E-02	mg/kg	N/A	EPA7196

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Number of Results:

### BLANK RESULTS

LAB NAME: QUANTERRA, Richland      SDG /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: CVLM611B      MATRIX: SOIL

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	1.00E-03	U	N/A	N/A	2.00E-03	mg/L	N/A	EPA7196

Number of Results:

**BLANK RESULTS**

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: CVLM811B MATRIX: SOIL

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
HEXCHROME	0.00E+00	U	N/A	N/A	2.00E-03	mg/L	N/A	EPA7196

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Number of Results:

### LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland      SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: CVLM612S      MATRIX: SOIL

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ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
HEXCHROME	4.52E-01		N/A	N/A	2.00E-03	mg/L	N/A	5.00E-01	90.40%

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Number of Results:

### LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland      SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: CVLM613S      MATRIX: SOIL

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ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
HEXCHROME	4.52E-01		N/A	N/A	2.00E-03	mg/L	N/A	5.00E-01	90.40%

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Number of Results:

LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: CVLM812S MATRIX: SOIL

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ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
HEXCHROME	4.33E-01		N/A	N/A	2.00E-03	mg/L	N/A	5.00E-01	86.60%

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Number of Results:

LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02765 / 7766  
LAB SAMPLE ID: CVLM813S MATRIX: SOIL

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ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
HEXCHROME	4.33E-01		N/A	N/A	2.00E-03	mg/L	N/A	5.00E-01	86.60%

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Number of Results:



Richland Laboratory  
Data Review Check List  
METALS

<u>Work Order Number(s):</u> CVFC8, CVFCA, CVFCC, CVFCE - QC Batch 9130439				
<u>Lab Sample Numbers or SDG:</u> WO 2765				
<u>Method/Test/Parameter:</u> CR16 in SOL				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
<b>A. Initial Calibration</b>				
1. Performed at required frequency with required number of levels?	✓			
2. Correlation coefficient within QC limits?	✓			
3. Initial calibration verification (ICV) analyzed immediately after calibration and results within QC limits?	✓			
4. Initial calibration blank(ICB) analyzed immediately after ICV and concentrations of all parameters ≤ reporting limit?	✓			
<b>B. Continuing Calibration</b>				
1. CCV analyzed at required frequency and all parameters within QC limits?	✓			
2. CCB analyzed at required frequency and all results ≤ reporting limit?	✓			
<b>C. Sample Analysis</b>				
1. Were any samples with concentrations above the linear range for any parameter diluted and reanalyzed?		✓		
2. Were all sample holding times met?	✓			
<b>D. QC Samples</b>				
1. All results for the preparation blank below limits?	✓			
2. MS or MS/MSD recoveries within QC limits and %RPD (for MSD) acceptable?			✓	
3. LCS percent recovery within QC limits and %RPD (for LCSD) acceptable?	✓			
4. Analytical spikes within QC limits where applicable?			✓	
5. ICP only: One serial dilution performed per SDG?			✓	
6. ICP only: CRDL standard (CRI or CRA) analyzed at required frequency?			✓	
7. ICP only: Interference check samples (ICSA, ICSAB) and HICAL analyzed at the required frequencies and within QC limits?			✓	

Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
<b>E. Other</b>				
1. Are all nonconformances included and noted?			✓	
2. Is the correct date and time of analysis shown?	✓			
3. Did the analyst sign and date the front page of the analytical run?	✓			
4. Correct methodology used?	✓			
5. Transcriptions checked?	✓			
6. Calculations checked at minimum frequency?	✓			
7. Units checked?	✓			

Comments on any "No" response:

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Analyst: Roxie Ross

Date: 5/13/99

Second-Level Review: \_\_\_\_\_

Date: \_\_\_\_\_



Richland Laboratory  
Data Review Check List  
METALS

Work Order Number(s): *0VGK5, CVGK6, CVGK7, CVGK8 in 1* *QC Batch 9130441*

Lab Sample Numbers or SDG: *W02765*

Method/Test/Parameter: *CRH6 in soil*

Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
<b>A. Initial Calibration</b>				
1. Performed at required frequency with required number of levels?	✓			
2. Correlation coefficient within QC limits?	✓			
3. Initial calibration verification (ICV) analyzed immediately after calibration and results within QC limits?	✓			
4. Initial calibration blank (ICB) analyzed immediately after ICV and concentrations of all parameters $\leq$ reporting limit?	✓			
<b>B. Continuing Calibration</b>				
1. CCV analyzed at required frequency and all parameters within QC limits?	✓			
2. CCB analyzed at required frequency and all results $\leq$ reporting limit?	✓			
<b>C. Sample Analysis</b>				
1. Were any samples with concentrations above the linear range for any parameter diluted and reanalyzed?			✓	
2. Were all sample holding times met?	✓			
<b>D. QC Samples</b>				
1. All results for the preparation blank below limits?	✓			
2. MS or MS/MSD recoveries within QC limits and %RPD (for MSD) acceptable?			✓	
3. LCS percent recovery within QC limits and %RPD (for LCSD) acceptable?	✓			
4. Analytical spikes within QC limits where applicable?			✓	
5. ICP only: One serial dilution performed per SDG?			✓	
6. ICP only: CRDL standard (CRI or CRA) analyzed at required frequency?			✓	
7. ICP only: Interference check samples (ICSA, ICSAB) and HICAL analyzed at the required frequencies and within QC limits?			✓	



**CHAIN OF  
CUSTODY FORMS**

Bechtel Hanford Inc.		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				B99-041-010	Page 1 of 1	
Collector Mike Stankovich		Company Contact Mike Stankovich		Telephone No. (509) 531-7620		Project Coordinator TRENT, SJ	Price Code	Data Turnaround
Project Designation 100 H Area - Quick Turn		Sampling Location 116-H-1		SAF No. B99-041		21 Day		
Ice Chest No. # 99-001		Field Logbook No. EL-1500		Method of Shipment Hand Delivered/Gov't Vehicle				
Shipped To Quanterra Incorporated		Offsite Property No. NA		Bill of Lading/Air Bill No. NA				
COA								

POSSIBLE SAMPLE HAZARDS/REMARKS	Preservation	Cool 4C											
	Type of Container	aG											
	No. of Container(s)	1											
Special Handling and/or Storage	Volume	60mL											
Radioactive Q-27347													
SDG WO2765	SAMPLE ANALYSIS JAE050199	Chromium Hex - 7196											
DM 5-26													

Sample No.	Matrix *	Sample Date	Sample Time										
BOV8N1 CVFCB	Soil	4-30-99	1225	✓									BOV8T6
BOV8N2 CVFCA	Soil	4-30-99	1245	✓									BOV8T7
BOV8N3 CVFCC	Soil	4-30-99	1255	✓									BOV8T8
BOV8N4 CVFCE	Soil	4-30-99	1310	✓									BOV8T9

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS COC - R11DX1 2000 ** Above indicated samples containers shipped directly to RECRA Lionville, PA.	Matrix * Soil Water Vapor Other Solid Other Liquid
Relinquished By <i>[Signature]</i> Date/Time 4-30-99 1735	Received By <i>[Signature]</i> Date/Time #10	323 IB = 3'0	
Relinquished By <i>[Signature]</i> Date/Time 5/5/99 1030	Received By <i>[Signature]</i> Date/Time 5/5/99 1030		
Relinquished By <i>[Signature]</i> Date/Time 5/5/99 1322	Received By <i>[Signature]</i> Date/Time 5/5/99 1322		
Relinquished By <i>[Signature]</i> Date/Time	Received By <i>[Signature]</i> Date/Time 2100CPM		
LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

0023

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5887Sample Date & Time 4/30/99 1225Project ID: 116-H-1 SAF Number: B99-041Date Analyzed 5/3/99Sample ID: B0V8T6

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.6E+01	+/- 2.2E+00	7.2E-01
Co-60 #	< 1.2E-02		1.2E-02
Cs-137	8.6E-01	+/- 1.1E-01	3.0E-02
Eu-152	2.0E+00	+/- 2.9E-01	5.9E-02
Eu-154 #	< 3.2E-02		3.2E-02
Eu-155	< 8.8E-02		8.8E-02
Th-232d	< 3.6E-01		3.6E-01
U-235	< 2.4E-01		2.4E-01
Np-237	< 4.3E-02		4.3E-02
U-238	< 6.5E+00		6.5E+00
U-238d	8.2E-01	+/- 1.2E-01	5.3E-02
Am-241	< 7.8E-02		7.8E-02

B0V8N1

Total GEA (pCi/g)	1.9E+01	+/-	2.7E+00
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	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 6.8E-01	
Gross Beta	1.2E+01	+/- 4.5E+00

Alpha MDC (pCi/g)	6.8E-01
Beta MDC (pCi/g)	7.4E+00

### Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested, <MDC = less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

### For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst

*K. A. Robertson-DeMers*  
K. A. Robertson-DeMers 5/4/99

Report To

Mike Stankovich

Dave St John

Fax

373-1395

372-9487

Report Printed: Tuesday, May 04, 1999

0024

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5888

Sample Date & Time 4/30/99 1245

Project ID: 116-H-1

SAF Number: B99-041

Date Analyzed 5/3/99

Sample ID: BOV8T7

**Gamma Energy Analysis**

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.8E+01	+/- 1.7E+00	3.0E-01
Co-60 #	< 1.2E-02		1.2E-02
Cs-137	2.2E+00	+/- 1.8E-01	5.0E-02
Eu-152	3.2E+00	+/- 3.2E-01	6.2E-02
Eu-154 #	< 9.2E-02		9.2E-02
Eu-155 #	< 1.2E-01		1.2E-01
Th-232d	1.3E+00	+/- 3.4E-01	3.8E-01
U-235 #	< 1.7E-01		1.7E-01
Np-237	< 8.7E-02		8.7E-02
U-238 #	< 6.1E+00		6.1E+00
U-238d	7.4E-01	+/- 1.4E-01	8.5E-02
Am-241	< 1.3E-01		1.3E-01

*BOV8N2*

Total GEA (pCi/g) 2.5E+01 +/- 2.7E+00

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 7.2E-01	
Gross Beta	8.1E+00	+/- 4.8E+00

Alpha MDC (pCi/g)	7.2E-01
Beta MDC (pCi/g)	7.9E+00

**Definitions:**

All errors reported at 2 standard deviations.  
 N/R = no result or analysis not requested. <MDC = Less than detection limit.  
 All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.  
 Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

**For soils and natural samples, the following applies:**

The analysis of U-238 is based on the activity of Pa-234m.  
 The analysis of Np-237 is based on the activity of Pa-233.  
 U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.  
 Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.  
 Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.  
 \*\*The gross alpha results are not corrected for mass absorption  
 # No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

*Kathryn A. Robertson*

Analyst

*Robertson* 5/4/99  
 K. A. Robertson-DeMers

Report To  
 Mike Stankovich  
 Dave St John

Fax  
 373-1395  
 372-9487

Report Printed: Tuesday, May 04, 1999

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5889

Sample Date & Time 4/30/99 1255

Project ID: 116-H-1 SAF Number: B99-041

Date Analyzed 5/3/99

Sample ID: BOV8T8

**Gamma Energy Analysis**

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.6E+01	+/- 1.6E+00	7.0E-01
Co-60 #	< 2.3E-02		2.3E-02
Cs-137	2.1E+00	+/- 1.6E-01	3.0E-02
Eu-152	2.4E+00	+/- 2.4E-01	5.9E-02
Eu-154 #	< 3.2E-02		3.2E-02
Eu-155	< 1.2E-01		1.2E-01
Th-232d	< 4.9E-01		4.9E-01
U-235	< 3.0E-01		3.0E-01
Np-237	< 8.8E-02		8.8E-02
U-238 #	< 5.0E+00		5.0E+00
U-238d	8.8E-01	+/- 1.3E-01	3.7E-02
Am-241	< 4.1E-02		4.1E-02

BOV8N3

Total GEA (pCi/g) 2.1E+01 +/- 2.1E+00

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 6.2E-01	
Gross Beta	< 6.8E+00	

Alpha MDC (pCi/g)	6.2E-01
Beta MDC (pCi/g)	6.8E+00

**Definitions:**

All errors reported at 2 standard deviations.  
 N/R = no result or analysis not requested. <MDC = Less than detection limit.  
 All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.  
 Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

**For soils and natural samples, the following applies:**

The analysis of U-238 is based on the activity of Pa-234m.  
 The analysis of Np-237 is based on the activity of Pa-233.  
 U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.  
 Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.  
 Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption  
 # No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

*Kathleen A. Robertson*

Analyst DeMers 5/4/99  
 K. A. Robertson-DeMers

Report To **Mike Stankovich** Fax **373-1395**  
**Dave St John** **372-9487**

Report Printed: Tuesday, May 04, 1999

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5890Sample Date & Time 4/30/99 1310Project ID: 116-H-1SAF Number: B99-041Date Analyzed 5/3/99Sample ID: BOV8T9

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.6E+01	+/- 1.7E+00	1.0E+00
Co-60	1.7E+00	+/- 2.1E-01	7.1E-02
Cs-137	4.2E+01	+/- 1.4E+00	1.6E-01
Eu-152	4.9E+01	+/- 2.1E+00	2.5E-01
Eu-154	4.0E+00	+/- 5.1E-01	2.3E-01
Eu-155	< 5.5E-01		5.5E-01
Th-232d	3.0E+00	+/- 1.3E+00	3.5E-01
U-235	< 7.6E-01		7.6E-01
Np-237	< 1.1E-01		1.1E-01
U-238 #	< 1.6E+01		1.6E+01
U-238d	< 2.6E-01		2.6E-01
Am-241	< 2.4E-01		2.4E-01

BOV8N4

Total GEA (pCi/g)	1.2E+02	+/-	7.3E+00
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	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 6.8E-01	
Gross Beta	2.9E+01	+/- 4.9E+00

Alpha MDC (pCi/g)	6.8E-01
Beta MDC (pCi/g)	7.4E+00

## Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. <MDC = Less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

## For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst

*Kathleen A. Robertson*  
*Re: Mers 5/4/99*  
 K. A. Robertson-DeMers

Report To

Mike Stankovich

Dave St John

Fax

373-1395

372-9487

Report Printed: Tuesday, May 04, 1999

0027

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 55991323 SG#: W02765  
Work Order Number: J9E050199 SAF #: B99-041  
Shipping Container ID: #99-001 Chain of Custody #: B99-041-010

- 1. Custody Seals on shipping container intact? Yes  No
- 2. Custody Seals dated and signed? Yes  No
- 3. Chain-of-Custody record present? 4OC Yes  No
- 4. Cooler temperature \_\_\_\_\_
- 5. Vermiculite/packing materials is \_\_\_\_\_ Wet  Dry
- 6. Number of samples in shipping container: 4
- 7. Sample holding times exceeded? Yes  No

8. Samples have:  
 tape                      \_\_\_\_\_ hazard labels  
 custody seals              \_\_\_\_\_ appropriate sample labels

9. Samples are:  
\_\_\_\_\_ in good condition              \_\_\_\_\_ leaking  
\_\_\_\_\_ broken                              \_\_\_\_\_ have air bubbles

- 10. Where any anomalies identified in sample receipt? Yes  No
- 11. Description of anomalies (include sample numbers): \_\_\_\_\_

Sample Custodian/Laboratory: L. Atkinson Date: 5599  
Telephoned To: \_\_\_\_\_ On \_\_\_\_\_ By \_\_\_\_\_

Bechtel Hanford Inc.		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				B99-041-011	Page 1 of 1
Collector Mike Stankovich		Company Contact Mike Stankovich		Telephone No. (509) 531-7620	Project Coordinator TRENT, SJ	Price Code	Data Turnaround
Project Designation 100 H Area - Quick Turn		Sampling Location 116-H-1		SAF No. B99-041	21 Days		
Ice Chest No. ERC 96-070		Field Logbook No. EL-1500		Method of Shipment Hand Delivered/Gov't Vehicle			
Shipped To Quanterra Incorporated		Offsite Property No. NA		Bill of Lading/Air Bill No. NA			
				COA			

POSSIBLE SAMPLE HAZARDS/REMARKS Radioactive	Preservation	Cool 4C																
	Type of Container	aG																
	No. of Container(s)	1																
Special Handling and/or Storage	Volume	60mL																
SDA		SAMPLE ANALYSIS		Date 5-27		Chromium Hex - 7196												
W02765		JAED00175																

Sample No.	Matrix *	Sample Date	Sample Time																
BOV8N5 CVGK5	Soil	5-3-99	0803	✓															BOV8V0
BOV8N6 CVGK6	Soil	5-3-99	0820	✓															BOV8V1
BOV8N7 CVGK7	Soil	5-3-99	0830	✓															BOV8V2
BOV8N8 CVGK8	Soil	5-3-99	0843	✓															BOV8V3

CHAIN OF POSSESSION		Sign/Print Names				SPECIAL INSTRUCTIONS COC - R11DX1 2000 ** Above indicated samples containers shipped directly to RECRA Lionville, PA.						Matrix * Soil Water Vapor Other Solid Other Liquid	
Relinquished By <i>M. Stankovich</i>	Date/Time 1710 5-3-99	Received By <i>#1/B</i>	Date/Time	NOTE: COLLECTOR UNAVAILABLE TO SIGN COC									
Relinquished By <i>REF 1-B</i>	Date/Time 5699 1030	Received By <i>SJGALE</i>	Date/Time 5699 1030										
Relinquished By <i>SJGALE</i>	Date/Time 5699 1130	Received By <i>K. [Signature]</i>	Date/Time 5699 1130										
Relinquished By	Date/Time	Received By	Date/Time										

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

0029

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5892

Sample Date & Time 5/3/99 0803

Project ID: 116-H-1 SAF Number: B99-041

Date Analyzed 5/4/99

Sample ID: B0V8V0

**Gamma Energy Analysis**

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.5E+01	+/- 1.4E+00	5.0E-01
Co-60 #	< 9.9E-03		9.9E-03
Cs-137	3.9E-01	+/- 7.1E-02	2.2E-02
Eu-152	7.4E-01	+/- 1.5E-01	4.9E-02
Eu-154 #	< 2.7E-02		2.7E-02
Eu-155	< 9.1E-02		9.1E-02
Th-232d	7.0E-01	+/- 1.0E-01	3.0E-01
U-235	< 2.7E-01		2.7E-01
Np-237	< 5.8E-02		5.8E-02
U-238d	7.2E-01	+/- 9.8E-02	2.3E-02
U-238	< 5.7E+00		5.7E+00
Am-241	< 7.3E-02		7.3E-02

Total GEA (pCi/g) 1.7E+01 +/- 1.8E+00

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	4.4E-01	+/- 5.0E-01
Gross Beta	1.7E+01	+/- 1.6E+00

Alpha MDC (pCi/g) 3.8E-01
Beta MDC (pCi/g) 9.3E+00

**Definitions:**

All errors reported at 2 standard deviations.  
 N/R = no result or analysis not requested. <MDC = Less than detection limit.  
 All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.  
 Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

**For soils and natural samples, the following applies:**

The analysis of U-238 is based on the activity of Pa-234m.  
 The analysis of Np-237 is based on the activity of Pa-233.  
 U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.  
 Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.  
 Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.  
 \*\*The gross alpha results are not corrected for mass absorption  
 # No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst Kathryn A. Robertson-DeMers 5/5/99  
 K. A. Robertson-DeMers

Post-It* Fax Note	7671	Date	# of pages ▶
To	Dave St. John	From	K.A. Robertson-DeMers
Co./Dept.		Co.	
Phone #		Phone #	373-9781
Fax #	372-9487	Fax #	

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5893Sample Date & Time 5/3/99 0820Project ID: 116-H-1SAF Number: B99-041Date Analyzed 5/4/99Sample ID: B0V8V1

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.9E+01	+/- 1.6E+00	5.5E-01
Co-60 #	< 1.2E-02		1.2E-02
Cs-137 #	< 2.3E-02		2.3E-02
Eu-152 #	< 5.8E-02		5.8E-02
Eu-154	< 5.1E-02		5.1E-02
Eu-155 #	< 8.8E-02		8.8E-02
Th-232d	7.2E-01	+/- 1.1E-01	3.6E-01
U-235	< 1.7E-01		1.7E-01
Np-237	< 6.3E-02		6.3E-02
U-238d	6.6E-01	+/- 1.2E-01	4.0E-02
U-238 #	< 4.1E+00		4.1E+00
Am-241	< 4.8E-02		4.8E-02

Total GEA (pCi/g)	2.0E+01	+/-	1.9E+00
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	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 2.8E-01	
Gross Beta	1.6E+01	+/- 1.5E+00

Alpha MDC (pCi/g)	2.8E-01
Beta MDC (pCi/g)	8.9E+00

### Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. <MDC = Less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

### For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst

*Katherine A. Robertson*  
*DeMers* 5/5/99  
 K. A. Robertson-DeMers

Report To

Mike Stankovich

Dave St John

Fax

373-1395

372-9487

Report Printed: Wednesday, May 05, 1999

0031

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5894

Sample Date & Time 5/3/99 0830

Project ID: 116-H-1

SAF Number: B99-041

Date Analyzed 5/4/99

Sample ID: B0V8V2

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.7E+01	+/- 1.5E+00	5.4E-01
Co-60 #	< 1.1E-02		1.1E-02
Cs-137	4.2E-01	+/- 7.1E-02	2.1E-02
Eu-152	< 2.0E-01		2.0E-01
Eu-154 #	< 5.0E-02		5.0E-02
Eu-155	< 9.2E-02		9.2E-02
Th-232d	9.1E-01	+/- 1.3E-01	3.4E-01
U-235	< 1.9E-01		1.9E-01
Np-237	< 5.5E-02		5.5E-02
U-238	< 5.7E+00		5.7E+00
U-238d	6.7E-01	+/- 1.1E-01	4.7E-02
Am-241 #	< 5.6E-02		5.6E-02

Total GEA (pCi/g) 1.9E+01 +/- 1.8E+00

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 3.1E-01	
Gross Beta	1.5E+01	+/- 1.5E+00

Alpha MDC (pCi/g)	3.1E-01
Beta MDC (pCi/g)	8.3E+00

### Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. <MDC = Less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

### For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst Kathleen Robertson  
DeMers 5/5/99  
 K. A. Robertson-DeMers

Report To  
 Mike Stankovich 373-1395  
 Dave St John 372-9487

Report Printed: Wednesday, May 05, 1999

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF5895

Sample Date & Time 5/3/99 0843

Project ID: 116-H-1

SAF Number: B99-041

Date Analyzed 5/4/99

Sample ID: B0V8V3

**Gamma Energy Analysis**

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	1.5E+01	+/- 2.2E+00	8.1E-01
Co-60	< 1.1E-02		1.1E-02
Cs-137	3.7E-01	+/- 7.8E-02	3.0E-02
Eu-152	5.4E-01	+/- 1.2E-01	5.5E-02
Eu-154 #	< 6.0E-02		6.0E-02
Eu-155	< 7.0E-02		7.0E-02
Th-232d	1.1E+00	+/- 1.9E-01	3.4E-01
U-235	< 2.1E-01		2.1E-01
Np-237	< 2.5E-02		2.5E-02
U-238	< 5.1E+00		5.1E+00
U-238d	6.6E-01	+/- 1.0E-01	6.2E-02
Am-241	< 4.7E-02		4.7E-02

Total GEA (pCi/g) 1.8E+01 +/- 2.7E+00

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 2.4E-01	
Gross Beta	1.6E+01	+/- 1.5E+00

Alpha MDC (pCi/g)	2.4E-01
Beta MDC (pCi/g)	8.8E+00

**Definitions:**

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. <MDC = Less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

**For soils and natural samples, the following applies:**

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst K. A. Robertson-DeMers 5/5/99  
 K. A. Robertson-DeMers

Report To Mike Stankovich Fax 373-1395  
Dave St John 372-9487

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 56-99 1130 SG#: W02765  
Work Order Number: J9E000.175 SAF #: B99-002 B99-041  
Shipping Container ID: ERC96-070 Chain of Custody # B99-002-90

1. Custody Seals on shipping container intact? B99-041-011 Yes  No
2. Custody Seals dated and signed? Yes  No
3. Chain-of-Custody record present? Yes  No
4. Cooler temperature 40C
5. Vermiculite/packing materials is Wet  Dry
6. Number of samples in shipping container: 9
7. Sample holding times exceeded? Yes  No

8. Samples have:  
 tape  hazard labels  
 custody seals  appropriate sample labels

9. Samples are:  
 in good condition  leaking  
 broken  have air bubbles

10. Where any anomalies identified in sample receipt? Yes  No
11. Description of anomalies (include sample numbers): \_\_\_\_\_

Sample Custodian/Laboratory: L. Stenberg Date: 56-99  
Telephoned To: \_\_\_\_\_ On \_\_\_\_\_ By \_\_\_\_\_

COC Signature Page

Batch #:	9130439	Initials/Date	Procedure #
Released By		JA 5-11-99	RC0009
Received		(R) 5-11-99	RICHWC5003 R.3
Released By		(R) 5-13-99	n/a
Received			
Released By			n/a
Received			
Released By			n/a
Received			
Released By			n/a
Received			
Released By			n/a
Received			
Released By			n/a
Received			

RQC050

Quanterra Incorporated  
WET CHEM BATCHSHEET  
Richland

Run Date: 5/10/99  
Time: 18:18:22

PRODUCTION FIGURES - WET CHEM

TOTAL NUMBER	SAMPLE NUMBER	QC	RE-RUN MATRIX	RE-RUN OTHER	MISC NUMBER	TOTAL HOURS	EXPANDED DELIVERABLE
METHOD: EA Hexavalent Chromium 6A) QC BATCH #: 9130439 INITIALS: _____ DATA ENTRY: _____ PREP DATE: 5/10/99 PREP _____ INITIALS _____ USER: ROSSR ANAL _____ DATE _____							

Work Order	Lab Number	Structured Analysis	Exp. Del.	Analysis Date	Sample ID:
CVFC8-1-01	J-9E050199-001	XX A 88 EA 5K		_____	BOV8N1
CVFCA-1-01	J-9E050199-002	XX A 88 EA 5K		_____	BOV8N2
CVFCC-1-01	J-9E050199-003	XX A 88 EA 5K		_____	BOV8N3
CVFCE-1-01	J-9E050199-004	XX A 88 EA 5K		_____	BOV8N4
CVLM6-1-01	J-9E100000-439-B	XX A 88 EA 5K		_____	INTRA-LAB BLANK
CVLM6-1-02	J-9E100000-439-C	XX A 88 EA 5K		_____	INTRA-LAB CHECK
CVLM6-1-03	J-9E100000-439-L	XX A 88 EA 5K		_____	INTRA-LAB CHECK

Control Limits

(85-115)

(85-115)

0036

COC Signature Page

Batch #: 9130441

Initials/Date

Procedure #

Released By	Initials/Date	Procedure #
Released By	<del>HR</del> 5/18/99	Rickrc0009
Received	(R) 5/18/99	RICHWC5003 R3
Released By	(R) 5/19/99	n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		

RQC050

Quanterra Incorporated  
WET CHEM BATCHSHEET  
Richland

Run Date: 5/10/99  
Time: 18:19:58

PRODUCTION FIGURES - WET CHEM

TOTAL NUMBER	SAMPLE NUMBER	QC	RE-RUN MATRIX	RE-RUN OTHER	MISC NUMBER	TOTAL HOURS	EXPANDED DELIVERABLE
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METHOD:	EA Hexavalent Chromium			6A)			
QC BATCH #:	9130441			INITIALS:			DATA ENTRY:
PREP DATE:	5/10/99			PREP			INITIALS
USER:	ROSSR			ANAL			DATE

Work Order	Lab Number	Structured Analysis	Exp. Del.	Analysis Date	Sample ID:
CVGK5-1-01	J-9E060175-001	XX A 88 EA 5K			BOV8N5 5.0009g
CVGK6-1-01	J-9E060175-002	XX A 88 EA 5K			BOV8N6 5.0013g
CVGK7-1-01	J-9E060175-003	XX A 88 EA 5K			BOV8N7 5.0044
CVGK8-1-01	J-9E060175-004	XX A 88 EA 5K			BOV8N8 5.0070
CVLM8-1-01	J-9E100000-441-B	XX A 88 EA 5K			INTRA-LAB BLANK
CVLM8-1-02	J-9E100000-441-C	XX A 88 EA 5K			INTRA-LAB CHECK
CVLM8-1-03	J-9E100000-441-L	XX A 88 EA 5K			INTRA-LAB CHECK

Control Limits

(85-115)

(85-115)

038